

*REMARKS/ARGUMENTS**Restriction Requirement*

The Office has issued a restriction requirement between the following two groups of claims:

Group I: Claims 198-215 and 218-223, drawn to a concentration-gradient quantum dot; and

Group II: Claims 216 and 217, drawn to a method of producing a ternary concentration-gradient quantum dot.

*Applicants' Election*

In response to the restriction requirement, applicants elect, with traverse, the invention of Group I (i.e., claims 198-215 and 218-223) for further prosecution.

*Discussion of the Restriction Requirement*

According to the Office, Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because the groups lack the same or corresponding special technical feature. In particular, the Office alleges that a quantum dot comprising a first semiconductor and a second semiconductor is taught by U.S. Patent 6,274,323 (Bruchez et al.). Applicants respectfully submit that the restriction requirement is improper for the reasons set forth herein and, therefore, request withdrawal of the restriction requirement.

This application is a U.S. national stage application based on the international application PCT/US04/13119. The Office alleges that the inventions defined by the claims of Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same “special technical features.” Under PCT Rule 13 (37 C.F.R. § 1.475), a group of inventions is considered linked to form a single general inventive concept where there is a technical relationship among the inventions that involves at least one common or corresponding special technical feature. See, e.g., M.P.E.P. § 1893.03(d). The expression “special technical features” is defined as meaning those technical features that define the contribution which each claimed invention, considered as a whole, makes over the prior art. *Id.*

The Office alleges that Groups I and II do not share the same or corresponding special technical feature because a quantum dot comprising a first semiconductor and a second semiconductor is taught by U.S. Patent 6,274,323 (Bruchez et al.). Applicants respectfully disagree with the Office's assessment of the corresponding special technical feature. The pending claims have in common a special technical feature of an *alloy concentration gradient*, which is not disclosed or suggested by the prior art. Accordingly, all of the pending claims are directed towards a concentration-gradient quantum dot, which is not taught by Bruchez et al., but rather, is a special technical feature that is common to all of the pending claims.

Bruchez et al. discloses that a quantum dot includes a "core" of one or more first semiconductor materials, and may be surrounded by a "shell" of a second semiconductor material (see column 9, lines 3-5). The core and/or the shell can be a semiconductor material and an "alloy or a mixture thereof" (see column 9, lines 11-18). Bruchez et al. teaches that different intensities may be achieved by varying the concentrations of the particular size semiconductor nanocrystal (see, column 14, lines 62-65). Bruchez et al. states that "as one of ordinary skill in the art will realize," the linewidths are dependent on the size heterogeneity of the semiconductor nanocrystals in each preparation (see, column 16, lines 38-41). Bruchez et al. teaches that for any particular composition selected for the semiconductor nanocrystals, it is possible to tune the emission to a desired wavelength by controlling the size of the particular composition of the semiconductor nanocrystal (see, column 17, lines 33-37). Therefore, Bruchez et al. repeatedly teaches that the emission of a quantum dot is altered by changing the *size* of the semiconductor nanocrystals.

Since the quantum dot disclosed by Bruchez et al. comprises a first semiconductor material in the core and a second semiconductor material in the shell, the composition of the core or shell is homogenous, i.e., the composition does not change throughout the core or shell volume. In contrast to the disclosure of Bruchez et al., the pending claims are directed to a concentration-gradient quantum dot comprising an alloy of a first semiconductor and a second semiconductor, wherein the concentration of the first semiconductor gradually increases from the core of the quantum dot to the surface of the quantum dot and the concentration of the second semiconductor gradually decreases from the core of the quantum dot to the surface of the quantum dot, and methods of making the same. Therefore, the

quantum dot recited in the pending claims comprises a non-homogenous structure within the core or shell volume, which differs from the homogenous structure of the quantum dot taught by Bruchez et al. The non-homogenous structure of the concentration-gradient quantum dot recited in the pending claims is essential to enable tuning of the emission color by changing the *composition* of the semiconductor nanocrystals, rather than the *size* of the semiconductor nanocrystals. Accordingly, in contrast to the assertions of the Office, Bruchez et al. does not disclose or suggest a *concentration-gradient quantum dot*, as recited in the pending claims.

In view of the foregoing, the currently pending claims are directed to the same and corresponding “special technical feature” (i.e., a concentration-gradient quantum dot). The concentration-gradient quantum dot recited in the claims of Group I may be produced by the methods recited in the claims of Group II. Given the special technical feature common to all of the claims, any search and consideration of the claimed subject matter of Group I will necessarily overlap the search and consideration of the claimed subject matter of Group II.

Accordingly, because of the common special technical feature of the claims of Groups I and II, the search and examination of the subject matter of claims 198-223 at the same time would not place a serious burden on the Examiner. Applicants, therefore, respectfully request withdrawal of the Restriction Requirement, and respectfully submit that the claims of Groups I and II should be examined together. If, however, the Restriction Requirement is not withdrawn, Applicants respectfully request that the claims of Group II (i.e., claims 216 and 217) be rejoined for examination in the event that the claims of elected Group I are found allowable. Such rejoinder would be appropriate since, as discussed above, the claims of Group II are drawn to a method of producing the concentration-gradient quantum dot of elected Group I.

#### *Conclusion*

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

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